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Foreword

The purpose of the *CDC Surveillance Summaries* is to make available the most current information on conditions of public health interest for which CDC has major responsibility. These reports complement other data published by CDC in the *Morbidity and Mortality Weekly Report (MMWR)*, the *MMWR* auxiliary publications, and other reports on specific subjects prepared by the responsible surveillance programs. This volume contains epidemiologic information derived from surveillance forms, special investigations, and other sources of information collected at the state and national levels.

History of CDC Surveillance Activities

CDC has been actively involved in disease-surveillance activities since the formation of the Communicable Disease Center in 1946. The original scope of the National Surveillance Program included the study of malaria, murine typhus, smallpox, psittacosis, diphtheria, leprosy, and sylvatic plague. In 1954, a surveillance section was established within the Epidemiology Branch of CDC, primarily concerned with planning and conducting continuing surveillance and making periodic reports. National emergencies such as the Asian influenza pandemic and the discovery of Legionnaires' disease have prompted the involvement of CDC in new surveillance activities. Over the years the surveillance activities of CDC have expanded to include not only new areas in infectious disease but also programs in human reproduction, environmental health, chronic disease, risk reduction, and occupational safety and health. Ongoing evaluation of these programs has led to new methods of data collection and analysis and has prompted examination of how data are disseminated to the public health community.

In 1980 and 1981, a survey of CDC staff and state epidemiologists suggested that improved coordination of surveillance reports with the *MMWR* and the *MMWR Annual Summary* (later titled *Summary of Notifiable Diseases, United States*) would facilitate timely publication; provide greater uniformity in the acquisition, evaluation, and reporting of surveillance data; and encourage use of these data. Several approaches to the development of a systematic process of disseminating disease-specific surveillance reports were considered. On the basis of considerations of timeliness, cost advantages, and editorial uniformity, a report published on a quarterly basis was recommended. Subsequent financial and personnel constraints have made it necessary to publish these reports less frequently.

Although this publication is published more often than once a year, it will typically contain annual data rather than interim data. The *Summary of Notifiable Diseases* will complement rather than serve as the cumulative summary of the *CDC Surveillance Summaries.*

Data Sources

Data on the reported occurrence of notifiable diseases are derived from reports supplied by the state and territorial departments of health and CDC program activities. These data are routinely published in the *MMWR*, and complementary data are published in *MMWR* auxiliary publications.

CDC also maintains national surveillance programs for selected diseases—with the cooperation of state and local health departments and other Federal agencies—and publishes detailed epidemiologic analyses periodically. Data appearing in the *CDC Surveillance Summaries* or in a separate surveillance report may not agree exactly with reports published in the *MMWR* because of differences in timing of reports or because of refinements in case definition. It should be noted that data collected for the *MMWR* and the more detailed data published by individual CDC programs are collected independently.

These data should be interpreted with caution. Some diseases that cause severe clinical illness and are associated with serious consequences are probably reported quite accurately. However, diseases that are clinically mild and infrequently associated with serious consequences are less likely to be reported. Additionally, subclinical cases are seldom detected except in the course of epidemic investigations or special studies. The degree of completeness of reporting is also influenced by the diagnostic facilities available, the control measures in effect, and the interests and priorities of state and local officials responsible for disease control and surveillance. Finally, factors such as the introduction of new diagnostic tests and the discovery of new disease entities may cause changes in disease reporting independent of the true incidence of disease. Despite these limitations, the data in these reports have proven to be very useful in the analysis of trends.

Surveillance Subjects and Responsible Organizational Units

The most recent surveillance data on specific subjects may be obtained from the following responsible organizational units at CDC:

Subject	Responsible Organizational Unit
Abortion	Division of Reproductive Health Center for Health Promotion and Education
Acquired immunodeficiency syndrome (AIDS)	AIDS Program Center for Infectious Diseases
Alcohol-related morbidity and mortality	Division of Surveillance and Epidemiologic Studies Epidemiology Program Office
Anthrax	Division of Bacterial Diseases Center for Infectious Diseases
Aseptic meningitis	Division of Bacterial Diseases Center for Infectious Diseases
Behavioral risk factors	Division of Nutrition Center for Health Promotion and Education
Botulism	Enteric Diseases Branch Division of Bacterial Diseases Center for Infectious Diseases
Brucellosis	Bacterial Zoonoses Activity Division of Bacterial Diseases Center for Infectious Diseases
Cancers, endometrial and ovarian	Epidemiologic Studies Branch Division of Reproductive Health Center for Health Promotion and Education
Chancroid	Division of Sexually Transmitted Diseases Center for Prevention Services
Cholera	Enteric Diseases Branch Division of Bacterial Diseases Center for Infectious Diseases
Congenital malformations	Division of Birth Defects and Developmental Disabilities Center for Environmental Health and Injury Control
Dengue	Dengue Branch Division of Vector-Borne Viral Diseases Center for Infectious Diseases
Diabetes	Division of Diabetes Control Center for Prevention Services
Diphtheria	Surveillance, Investigations, and Research Branch Division of Immunization Center for Prevention Services

Subject	Responsible Organizational Unit
Drinking and Driving	Division of Nutrition Center for Health Promotion and Education
Encephalitis	Arbovirus Reference Branch Division of Vector-Borne Viral Diseases Center for Infectious Diseases
Enterovirus	Respiratory and Enterovirus Branch Division of Viral Diseases Center for Infectious Diseases
Foodborne disease	Enteric Diseases Branch Division of Bacterial Diseases Center for Infectious Diseases
Gonorrhea	Division of Sexually Transmitted Diseases Center for Prevention Services
Hazards, occupational	Surveillance Branch Division of Surveillance, Hazard Evaluations, and Field Studies National Institute for Occupational Safety and Health
Hepatitis	Hepatitis Branch Division of Viral Diseases Center for Infectious Diseases
Homicide	Division of Injury Epidemiology and Control Center for Environmental Health and Injury Control
Hysterectomy	Epidemiologic Studies Branch Division of Reproductive Health Center for Health Promotion and Education
Immunization survey	Surveillance, Investigation, and Research Branch Division of Immunization Center for Prevention Services
Infections, nosocomial	National Nosocomial Infections Surveillance System Hospital Infections Program Center for Infectious Diseases
Influenza	Influenza Branch Division of Viral Diseases Center for Infectious Diseases
Injury	Division of Injury Epidemiology and Control Center for Environmental Health and Injury Control
Injury, occupational	Division of Safety Research National Institute for Occupational Safety and Health

Subject	Responsible Organizational Unit
Lead poisoning in workers	Surveillance Branch Division of Surveillance, Hazard Evaluations, and Field Studies National Institute for Occupational Safety and Health
Legionellosis	Respiratory Diseases Branch Division of Bacterial Diseases Center for Infectious Diseases
Leprosy	Respiratory and Special Pathogens Branch Division of Bacterial Diseases Center for Infectious Diseases
Leptospirosis	Bacterial Zoonoses Activity Division of Bacterial Diseases Center for Infectious Diseases
Lymphogranuloma venereum	Division of Sexually Transmitted Diseases Center for Prevention Services
Malaria	Malaria Branch Division of Parasitic Diseases Center for Infectious Diseases
Measles	Surveillance, Investigations, and Research Branch Division of Immunization Center for Prevention Services
Meningitis, bacterial	Meningitis and Special Pathogens Branch Division of Bacterial Diseases Center for Infectious Diseases
Meningitis, viral	Division of Viral Diseases Center for Infectious Diseases
Mortality, infant	Division of Reproductive Health Center for Health Promotion and Education
Mortality, maternal	Division of Reproductive Health Center for Health Promotion and Education
Mumps	Surveillance, Investigations, and Research Branch Division of Immunization Center for Prevention Services
Nutrition	Division of Nutrition Center for Health Promotion and Education
Pelvic inflammatory disease	Division of Sexually Transmitted Diseases Center for Prevention Services
Pertussis	Division of Immunization Center for Prevention Services
Plague	Plague Branch Division of Vector-Borne Viral Diseases Center for Infectious Diseases

Subject	Responsible Organizational Unit
Pneumoconiosis, coal workers	Epidemiological Investigations Branch Division of Respiratory Disease Studies National Institute for Occupational Safety and Health
Poliomyelitis	Surveillance, Investigations, and Research Branch Division of Immunization Center for Prevention Services
Pregnancy and fertility, teenage	Division of Reproductive Health Center for Health Promotion and Education
Pregnancy, ectopic	Division of Reproductive Health Center for Health Promotion and Education
Psittacosis	Bacterial Zoonoses Activity Division of Bacterial Diseases Center for Infectious Diseases
Rabies	Viral and Rickettsial Zoonoses Branch Division of Viral Diseases Center for Infectious Diseases
Reye syndrome	Epidemiology Office Division of Viral Diseases Center for Infectious Diseases
Rickettsial disease (Rocky Mountain spotted fever, typhus, Q fever, endemic typhus)	Viral and Rickettsial Zoonoses Branch Division of Viral Diseases Center for Infectious Diseases
Rocky mountain spotted fever	Viral and Rickettsial Zoonoses Branch Division of Viral Diseases Center for Infectious Diseases
Rubella	Surveillance, Investigations, and Research Branch Division of Immunization Center for Prevention Services
Salmonella	Enteric Diseases Branch Division of Bacterial Diseases Center for Infectious Diseases
Sexually transmitted diseases	Division of Sexually Transmitted Diseases Center for Prevention Services
Shigella	Enteric Diseases Branch Division of Bacterial Diseases Center for Infectious Diseases
Smoking	Office on Smoking and Health Center for Health Promotion and Education
Sterilization, surgical	Epidemiologic Studies Branch Division of Reproductive Health Center for Health Promotion and Education

Subject	Responsible Organizational Unit
Sudden unexplained death syndrome, Southeast Asian refugees	Division of Environmental Hazards and Health Effects Center for Environmental Health and Injury Control
Suicide	Division of Injury Epidemiology and Control Center for Environmental Health and Injury Control
Summer mortality	Division of Environmental Hazards and Health Effects Center for Environmental Health and Injury Control
Syphilis	Division of Sexually Transmitted Diseases Center for Prevention Services
Toxic shock syndrome	Respiratory and Special Pathogens Branch Division of Bacterial Diseases Center for Infectious Diseases
Trichinosis	Helminthic Diseases Branch Division of Parasitic Diseases Center for Infectious Diseases
Trichomoniasis	Division of Sexually Transmitted Diseases Center for Prevention Services
Tuberculosis	Division of Tuberculosis Control Center for Prevention Services
Tularemia	Division of Bacterial Diseases Center for Infectious Diseases
Typhoid	Enteric Diseases Branch Division of Bacterial Diseases Center for Infectious Diseases
Typhus	Viral and Rickettsial Zoonoses Branch Division of Viral Diseases Center for Infectious Diseases
Venereal disease	Division of Sexually Transmitted Diseases Center for Prevention Services
Water-related disease	Enteric Diseases Branch Division of Bacterial Diseases Center for Infectious Diseases

Trichinosis Surveillance, 1985

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Introduction

Trichinosis, infection with *Trichinella spiralis*, persists as a public health problem in the United States. Although fewer than 100 cases per year are now being reported, many mild or asymptomatic infections are undetected or misdiagnosed unless they are related epidemiologically to more severe cases (*1*). Public health officials believe that the reported cases represent only a fraction of the total number of cases that occur each year. Nevertheless, the current surveillance system is useful in monitoring trends in disease incidence, in initiating outbreak investigations, and in identifying groups at high risk for the infection.

Materials and Methods

State health departments report new cases of trichinosis by week to the National Morbidity Reporting Service. Supplemental epidemiologic information is submitted by the reporting state on Surveillance Case Report forms (CDC 54.7-Rev 7-81) to the Division of Parasitic Diseases (DPD), Center for Infectious Diseases, CDC. Additional cases are identified through reported results of trichinosis serologic tests performed by the Helminthic Diseases Branch, DPD, and through investigations conducted by the DPD staff.

This year the case definition for trichinosis has been expanded to reflect the importance of serologic testing in identifying a case of trichinosis. Criteria for the inclusion of cases in outbreaks have been simplified and expanded to reflect the importance of serologic testing in identifying mild or asymptomatic associated cases that are linked epidemiologically to an implicated meal or meat product.

The CDC case definition for trichinosis is as follows:

1. *Trichinella*-positive muscle biopsy or positive serologic test for trichinosis in a patient with clinical symptoms compatible with trichinosis (including eosinophilia, fever, myalgia, and periorbital edema),

   or

2. In an outbreak, at least one individual must meet criterion #1. Associated cases are defined by either a positive serologic test for trichinosis or clinical symptoms compatible with trichinosis (including eosinophilia, fever, myalgia, and periorbital edema) in persons who have shared the epidemiologically implicated meal or have consumed the implicated meat product.

As in the past, cases reported by the states but not characterized by written surveillance reports or not fitting the case definition are not included in this report. The expanded criteria were used for the evaluation of suspected cases of trichinosis reported to CDC in 1985.

Results

In 1985, 46 cases of trichinosis from 11 states were reported to CDC. Thirty-two (70%) of these cases occurred in Alaska, Maine, New Jersey, and Pennsylvania.

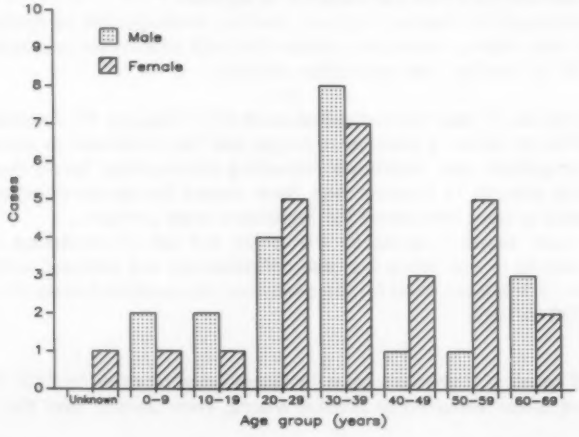
Alaska reported the largest number of cases, 19, or 41% of the total (Table 1). The Middle Atlantic and New England states accounted for 39% of the reported cases. States with the highest 5-year mean trichinosis incidence for 1981-1985 were Alaska (15.4 cases/1,000,000 population), Rhode Island (7.3), Connecticut (3.8), New Jersey (2.1), and Vermont (1.9). Moderately high mean incidence was reported in Hawaii (1.4) and in Maine (1.1). No cases were reported for this period in Alabama, Arizona, Arkansas, Georgia, Iowa, Kansas, Kentucky, Minnesota, Mississippi, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, South Carolina, South Dakota, Tennessee, and Wyoming. The other states reported between 0.1 and 1.0 case/1,000,000 population.

Of the 46 cases reported in 1985, 46% occurred in males and 54% in females. The mean age of patients was 36.1 years, ranging from 2 to 67 years (Figure 1).

Table 1. Trichinosis cases, by state, United States, 1985

State	Cases	Percent	Rate per million population
Alaska	19	41.3	39.7
Colorado	1	2.2	0.3
Connecticut	2	4.3	0.6
Florida	1	2.2	0.1
Maine	5	10.9	4.4
Michigan	3	6.5	0.3
New Jersey	4	8.7	0.5
New York	3	6.5	0.2
Pennsylvania	4	8.7	0.3
Texas	3	6.5	0.2
Wisconsin	1	2.2	0.2
TOTAL	**46**	**100**	**0.2**

FIGURE 1. Trichinosis cases, by age group and sex, United States, 1985



In previous years, a consistent seasonal pattern for trichinosis in the United States showed a peak in December and January that was related to the consumption of homemade pork sausage during the Christmas holidays. No such peak was evident in 1984 or 1985. In 1984, a large proportion of cases were reported in May and were associated with smoked sausage prepared by an ethnic club for Easter. In 1985, a large proportion of cases were reported in March and were associated with grizzly bear meat used in Alaska (Figure 2).

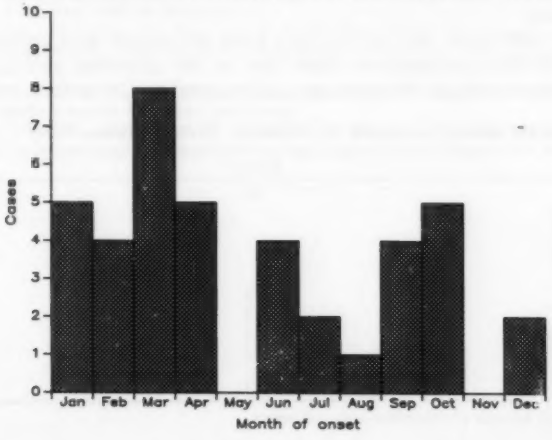
All of the patients reported at least one of the common signs and symptoms of trichinosis: 28 (62%) of 45 had fever, 23 (52%) of 44 had periorbital edema, 30 (65%) of 46 had myalgia, and 43 (98%) of 44 had eosinophilia. Most of the patients recovered, one patient died, and the outcomes for four were unknown.

The mean incubation period for the 27 cases for which the dates of consumption of incriminated meat and onset of symptoms were available was 19.6 days (range = 1-62 days). Diagnosis of trichinosis was confirmed by serologic tests for 17 persons (55% of those who had serologic testing done). Muscle biopsy was performed on 11 patients (24%), and all results were positive.

The infective meat item was identified in 43 of 46 cases; however, in only 12 cases (of which four were from the Alaska outbreak and five were from an outbreak in Maine) was the suspected food item examined for *Trichinella* larvae. Eleven of the 12 items were positive. Where the food item was known or suspected, pork was incriminated in 21 (49%) cases, bear meat in 15 (35%), and other meat in seven (16%). Sausage was the form of pork most frequently implicated—in 13 (30%) of the cases (Table 2).

The method of meat preparation was identified in 35 cases: in nine (26%) of these the meat was eaten raw, in 15 (43%) it was boiled, in five (14%) it was fried, and in the other six cases various methods of preparation were used. In 16 cases (39% of those for which a source was reported) the implicated meat was obtained from a supermarket, butcher shop, or other commercial outlet. In five (12%) cases it was obtained

FIGURE 2. Trichinosis cases, by month of onset, United States, 1985



directly from the farm, and in 20 (49%) the meat was obtained through hunting. Of these 20, the most common game animal was bear (15 cases), whereas walrus accounted for four cases, and in one case the animal was not identified.

Five common-source outbreaks accounted for 27 (59%) of the 46 cases reported to CDC in 1985. Two of these outbreaks have been previously reported (*2*). The largest outbreak occurred in Alaska in March. Signs and symptoms suggestive of trichinosis developed in 14 of 19 persons who ate grizzly bear meat. The implicated meat had been frozen for approximately 3 weeks, and the frozen meat was cut into bite-sized pieces and cooked in a stew with vegetables for 1-2 hours before being served at a birthday party. Sixteen persons ate the stew. At the time of the investigation, no samples of meat were available for examination. Test results of sera drawn from 17 persons 3 months after consumption of the bear meat were negative, with one exception; the index patient had a titer of 1:20 in the bentonite flocculation test.

In the second largest outbreak, which occurred in Maine, 19 persons ate pork from a sow purchased at a local farm. Data are not available for three of these persons, but of the 16 others, five showed signs and symptoms of trichinosis. Meat samples from the implicated pig were found to have 300 *Trichinella* larvae/g. Convalescent-phase sera were obtained from 11 persons, two of whom had titers of ≥1:10, with signs and symptoms of trichinosis.

Other outbreaks involved the consumption of raw walrus meat that had been frozen for an unknown period of time (four cases in Alaska) and undercooked sausage (two cases each in New Jersey and Michigan).

Discussion

Since the late 1940s and early 1950s, the annual incidence of trichinosis in the United States has declined progressively (*3*). The lowest annual incidence was in 1983, when only 30 cases of trichinosis were reported (*4*). In 1984, 65 cases were reported, with one death (*5*). In 1985, 46 cases were reported, with one death. In the 5-year period 1981-1985, the mean number of cases reported was 85; however, in the period 1983-1985, the mean number of cases reported per year was 47. No apparent change in the surveillance system can account for this downward trend in the number of reported cases.

Over half of the cases reported in 1985 were associated with common-source outbreaks. Outbreak investigations often lead to the detection and diagnosis of associated cases that would otherwise go undiagnosed and, therefore, unreported if

Table 2. Trichinosis cases, by source of infection, United States, 1985

Food	Cases*	Percent
Pork	21	48.8
Sausage 13		
Chops 2		
Roast 2		
Other 4		
Bear	15	34.9
Walrus	4	9.3
Other wild animal	1	2.3
Ground beef	2	4.7
TOTAL	**43**	**100**

*In three cases the source of infection was unknown.

they occurred as sporadic individual cases. Investigations also help to identify risk factors associated with trichinosis (*6*). Through the surveillance system, investigators have found that a large number of cases have occurred in the Middle Atlantic and New England states because of the high concentration of ethnic groups whose culinary preferences include raw or lightly cooked pork. The ethnic groups identified primarily consist of traditionally Eastern European populations such as those of Italian, German, or Polish descent. Immigrants from Southeast Asia have also been found to be a high-risk group because of similar culinary preferences (*7*).

Recent surveys have demonstrated that trichinosis prevalence varies in different regions of the country; 0.58% of the pigs examined from selected slaughterhouses in the Middle Atlantic states and 0.73% of those from slaughterhouses in the New England states have been infected with *Trichinella* (*8,9*), surpassing the estimated nationwide rate of 0.1% (*10*). However, in a slaughterhouse-based survey of 1,223 pigs in Louisiana, only one infected animal was detected (*11*), and of 3,245 pigs examined from five midwestern states, not one infected carcass was detected (B. Stromberg, personal communication). These findings suggest that both the prevalence of trichinosis in the local swine population and local food preferences are contributing factors to the risk of human infection. The impact of these risk factors needs further investigation.

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State Activities for Surveillance of Occupational Disease and Injury, 1985

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Introduction

Accurate surveillance of occupational disease and injury is essential to effective prevention programs. In the past, no systematic approach has been available to public health officials for identifying, reporting, or following up on adverse health conditions related to specific occupations, and surveillance efforts have been inadequate to meet the health information needs of prevention programs. Recognizing that state health departments play an important role in the surveillance of occupational disease (*1*), the National Institute for Occupational Safety and Health (NIOSH), in 1981, began a series of cooperative agreements with state health departments to help them develop occupational surveillance programs and build surveillance capacity within their departments. To date, NIOSH has awarded approximately $2.7 million to support 22 state projects. Under one of these agreements, in 1985 the Iowa Department of Public Health conducted a mail-based survey of state epidemiologists to determine the activities of state health departments in the surveillance of occupational disease and injury (*2*). This report summarizes conditions existing at the time of the survey but does not reflect changes in activity since that time.

Methods

The survey focused on the use of eight sources of information about occupational health or hazards: 1) health care providers, 2) death certificates and autopsy reports, 3) birth certificates, 4) cancer registries, 5) registries for occupational diseases other than cancer, 6) hospital or insurance billing information, 7) workers' compensation claims, and 8) environmental sampling data (measured levels of the hazards to which workers are exposed).

Health departments in all 50 states, New York City, and the District of Columbia responded. Except for telephone calls to correct inconsistencies, no attempt was made to verify the responses independently or to complete questions left blank.

Results

The following is a brief description of the eight potential data sources and a discussion of the responses and their implications.

Health Care Providers

Thirty-two (62%) of the health departments had voluntary or mandatory programs that require health care providers to report occupational diseases or injuries to a state

agency (Table 1, Figure 1). At the time of the survey (1985), legislation was pending in California, Florida, Maine, Massachusetts, and New Jersey to require the reporting of occupational illnesses or to add additional diseases to those already required; laws were subsequently passed in California, Maine, and New Jersey. Groups required or asked to report were private physicians (25 states), hospitals (19), laboratories (17), and others (13) (e.g., nursing home administrators, labor unions, and employers). Case reports were directed to more than one agency in six states. Overall, reports

Table 1. Activities for the surveillance of occupational disease reported by health departments in 50 states, New York City, and the District of Columbia, by source of data, 1985

Source	Activity	Number of departments reporting
Health care providers	providers report	32
	mandatory for some diseases	29
	voluntary	3
	penalties for not reporting	16
	all six sentinel health events	16
	reporting criteria developed	5
	follow-up of some cases	18
	intervention efforts	10
	data analyzed/published	7
Death certificates and autopsy reports	occupation/industry data coded	31
	machine readable	28
	analyzed	23
	published	10
	Part II cause-of-death machine readable	29
	central file of autopsy reports	15
Birth certificates	parents' occupation recorded	14
	parents' place of employment recorded	5
	data coded/machine readable	9
	data analyzed/published	4
Cancer registries	registries maintained	32
	occupational histories included	18
	worksite medical data included	9
	data analyzed/published	5
Registries for occup. diseases other than cancer	registries maintained	7
	data analyzed/published	5
	occupational histories included	4
Hospital or insurance billing information	data received and analyzed	4
Workers' compensation claims	machine readable	33
	state labor department analyzes	24
	state health department analyzes	8
Environmental sampling data	data collected	23
	company name/address	21
	employee identifiers	17
	dust levels	17
	other contaminant levels	20
	noise levels	14

were sent to state health departments (25 respondents), labor departments (7), and other agencies (4) (e.g., county health departments or worker compensation boards).

Reporting of occupational diseases was ascertained by collecting information on six sentinel health events (*3*). Of the six conditions, lead poisoning was most frequently listed as reportable (28 respondents), and Arkansas, Colorado, New Jersey, New York State, and Utah had criteria for evaluating case reports. Criteria varied among these states (e.g., in Colorado, blood lead levels required to be reported were >25μg/100 ml; in New Jersey, ≥25μg/100 ml; and in New York, ≥40μg/100 ml).

In 10 states, the health department used case reports in its intervention activities, such as in worker education, employer consultation, or engineering controls. Eighteen state health departments indicated that they try to obtain additional details beyond the initial report—some routinely, some periodically (e.g., reviewing medical records, obtaining a complete occupational history, and/or evaluating the worksite environment). Seven departments publish a summary of information from case reports, but no department had evaluated its surveillance program to see if all cases were being reported.

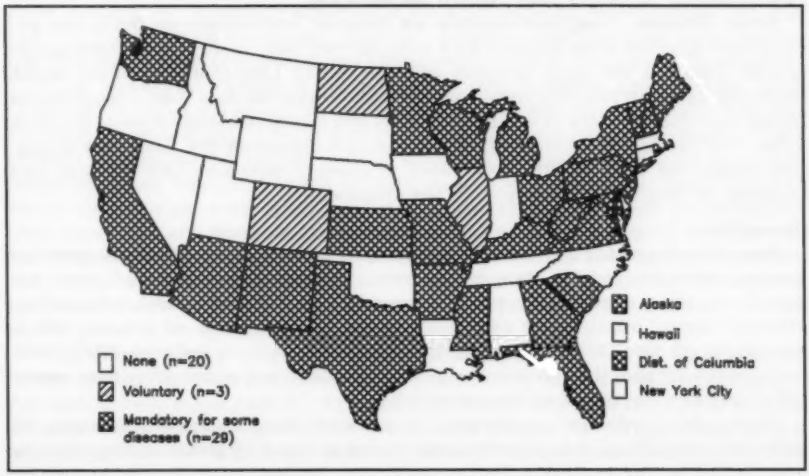
Death Certificates and Autopsy Reports

Both death certificates and autopsy reports include information on the relationship between work-related factors and the death. Fifty-six percent of the health departments reported that they maintain in machine-readable form the cause-of-death data contained in Part II of death certificates. Fifteen states maintain a central file of autopsy reports. Nine states maintain both Part II death-certificate data in machine-readable form and a central file of autopsy reports.

Birth Certificates

In some states, birth certificates list both the father's and the mother's occupations and may also list the parents' places of employment. Despite the potential usefulness

FIGURE 1. Reporting of occupational illness, by location and type of mandate covering health care providers, United States, 1985



of this information, only 14 (27%) departments collect it, and only four (8%) of these analyze it.

Cancer Registries

Cancer registries are becoming an important source of health information for use in prevention. Information now being recorded in cancer registries may include occupational histories and medical data collected at the worksite. Central cancer registries were reported by 32 departments; 11 of these collect an occupational history on every case, and seven collect an occupational history on selected cases.

Registries for Occupational Diseases Other Than Cancer

Seven states—Colorado, Hawaii, Maryland, New Jersey, Nevada, New York, and North Carolina—reported maintaining registries for occupational diseases other than cancer. Conditions covered by the registries include silicosis; asbestosis; exposures to heavy metals, toxic substances, carbon monoxide, pesticides, and radiation; and congenital malformations. Five of the registries include occupational histories and medical data; three also include smoking histories and data on worksite environmental sampling.

Hospital or Insurance Billing Information

Only four states use hospital or private insurance billing information, but this source may prove valuable for occupational surveillance if certain problems—such as maintaining patient confidentiality, frequent readmissions that result in duplication, and lack of direct access to hospital records—can be overcome. To help make hospital records more useful, Wisconsin passed state legislation to standardize required occupational information.

Workers' Compensation Claims

Thirty-three departments reported having workers' compensation claims in machine-readable form. State labor departments analyze these data in 24 states, independent of any analysis by the Supplementary Data System of the U.S. Bureau of Labor Statistics. State health departments also analyze the data in eight states.

Environmental Sampling Data (Hazard Surveillance)

When diseases in exposed workers are detected, information on the levels and conditions to which these workers were exposed may help public health investigators identify others at the same worksite who are at risk. Less than half of the health departments report that they collect worksite environmental data. Some departments obtain such data from the Occupational Safety and Health Administration or the Mine Safety and Health Administration; others collect it independently. California legislation allows the state health department to monitor exposure and medical data collected by employers in compliance with regulations.

Discussion

Regarding the eight potential data sources queried for surveillance of occupational disease, machine-readable data on workers' compensation was listed most frequently as being available for surveillance purposes (63% of states), followed by provider reports (62%), death certificates coded for occupation or industry (60%), environmental data (44%), cancer registries with occupational histories (35%), birth certificates with parents' occupations (27%), registries for diseases other than cancer (13%), and hospital or private insurance (8%).

There is scant information with which to compare these results. A 1981 survey of state and local offices that maintain vital statistics found 18 states coding industry

and/or occupation on some death certificates (*4*); in the current survey, 31 respondents reported this activity. Although this is an encouraging increase, results of the current survey indicate that surveillance activities for occupational disease are not uniform from state to state and that considerable room for improvement still exists. For example, only seven state health departments publish a summary of information reported by health care providers, and five departments report no activity related to the eight potential data sources.

Surveillance of occupational illness and injury serves two basic purposes. The first is to detect cases of illness and injury so that intervention strategies can be targeted to affected groups and individuals and their worksites. Although the established surveillance systems for communicable diseases are helpful models, the circumstances of many work-related disorders require unique approaches to develop a comprehensive system for detecting specific occupational disorders. The second purpose is to monitor trends in the occurrence of work-related diseases and injuries to help evaluate the effectiveness of specific interventions.

Because of the complex and multifactorial nature of many work-related health conditions, surveillance often focuses on workplace hazards as well as health events. Hazard surveillance consists of the periodic characterization of chemical or physical hazards in the workplace and may provide very useful information in the absence of a simultaneous assessment of health status. In many industries, hazard surveillance by direct measurement of levels of airborne contaminants or noise levels is used to direct strategies for primary prevention. Although health surveillance and hazard surveillance can be performed as separate, isolated endeavors, linkage of the two in the same population is often preferable.

State health departments must play a part in any comprehensive surveillance activity that is to be effective. Surveillance activities should also involve local health departments that can intervene at the worksite, especially in small businesses. Cooperative arrangements between state departments of health and labor can direct intervention activities to needs identified by local surveillance reports. Thus, "grassroots" support for prevention activities at the workplace can be developed. For this type of support to be developed, however, persons reporting cases must receive feedback in the form of analyses and interpretation of the data they have reported.

In the process of increasing the quantity of data collected, several states have developed innovative approaches to improving the quality of surveillance data. For example, the annual report by California on workers' compensation claims now links workers' compensation reports with a summary of death certificates on which pneumoconiosis was listed as the primary cause. The Virginia State Department of Health consolidates statistics on occupational diseases from workers' compensation files, physicians, and hospitals and provides feedback on the results via an epidemiologic bulletin sent to all physicians. To be effective, any surveillance system ultimately depends on analysis, interpretation, and feedback to persons reporting. In turn, any national surveillance program depends on the consolidation of information provided by the states to the appropriate health agencies.

NIOSH has recently proposed national strategies to prevent 10 leading work-related diseases and injuries (*5*). In each strategy, state-based surveillance is recommended to help target new or improved prevention programs and to monitor the effectiveness of these programs. NIOSH remains committed to the aggressive pursuit of a comprehensive national surveillance plan with six basic elements:

1. To develop a model system for state reporting of occupational disorders
2. To incorporate occupational concerns into national health surveys (e.g., National Health and Nutrition Examination Survey)
3. To improve systems for hazard surveillance
4. To develop uniform approaches for using existing sources of health data
5. To disseminate information on surveillance methods
6. To place the 10 leading work-related diseases and injuries under nationwide surveillance

The efforts of state health departments are critical to the success of this plan. As the objectives of the plan are achieved, a more comprehensive and uniform approach to the surveillance of occupational disorders will be established throughout the country.

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Ectopic Pregnancy Mortality in the United States, 1979-1982

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Introduction

From 1970 through 1983, the number of ectopic pregnancies in the United States increased from 17,800 to 69,600 (*1*). During this same period, the rate of ectopic pregnancies for women 15-44 years of age increased from 4.5 to 14.0 per 1,000 reported pregnancies (live births, legally induced abortions, and ectopic pregnancies).

Despite increases in both the number and the rate of ectopic pregnancies, the number and rate of deaths due to ectopic pregnancy in the United States decreased (*1*). In 1970, 63 deaths due to ectopic pregnancy were reported, a rate of 35.5 deaths per 10,000 ectopic pregnancies; in 1983, 37 deaths due to ectopic pregnancy were reported, a rate of 5.3 deaths per 10,000 ectopic pregnancies. However, this decrease in ectopic pregnancy mortality was less than the decrease in the number of maternal deaths due to three other major causes (hemorrhage, infection, and embolism) during the same period. Consequently, by 1982, ectopic pregnancy had become the second leading cause of maternal mortality in the United States (*2*).

In 1979, CDC began a nationwide surveillance program to document the number and characteristics of women dying from ectopic pregnancies and to help prevent mortality associated with ectopic pregnancies. Mortality data for 1979-1980 have been reported (*3,4*). This report updates that information and presents data on all known deaths from ectopic pregnancy that occurred in the United States from 1979 through 1982.

Methods

For this study, an ectopic pregnancy was defined as a pregnancy located outside the uterine cavity, including tubal, cervical, cornual, ovarian, and abdominal pregnancies, as well as pregnancies in a rudimentary horn of an anomalous uterus. An ectopic pregnancy death was defined as any death resulting from a complication of an ectopic pregnancy or the chain of events initiated by that pregnancy, regardless of the amount of time between termination of pregnancy and death.

CDC contacted the health departments of all 50 states, New York City, and the District of Columbia for information about ectopic pregnancy deaths. Additional information was obtained from the National Center for Health Statistics (NCHS) and from CDC's statistics on abortion mortality. Death certificates, medical records, and autopsy reports were reviewed. Since clinical information was frequently unavailable on decedents who had not received professional medical care, the results reported in this surveillance summary were based on characteristics of known cases.

The estimated number of ectopic pregnancies was based on data from the National Hospital Discharge Survey (NHDS). This survey is a systematic sample of

medical records from a representative sample of hospitals in the United States. Each year, it includes approximately 200,000 records from about 400 nonfederal, short-stay hospitals in the 50 states and the District of Columbia. The NHDS abstracts the first seven diagnoses listed for each patient. For this report, investigators identified ectopic pregnancies by reviewing all seven diagnoses for discharges coded 633, according to the International Classification of Diseases, Ninth Revision (ICD-9).

The geographic regions used in this report are those defined by the U.S. Bureau of the Census. The risk of death is the number of women dying of ectopic pregnancy per 10,000 women hospitalized for ectopic pregnancy. The relative risk is the ratio of the risk of death of one group divided by the risk of death of the group in the same category with the lowest risk of death. Variances for the NHDS estimates of hospitalized patients with ectopic pregnancies are available from published tables (*5*). A zero variance was assumed for the counts of deaths, and the variance for a ratio of random variables was calculated by a standard method (*6*). Estimates of the number of ectopic pregnancies have been rounded to the nearest 100. For both the number of ectopic pregnancies and the deaths due to ectopic pregnancy, the racial category "white" includes Hispanics.

Results

From 1979 through 1982, a total of 180 ectopic pregnancy deaths were reported to CDC. Following investigation, 166 of these were classified as deaths due to ectopic pregnancy (Table 1). In the 14 other deaths, only two of the decedents had had an ectopic pregnancy. One of these two deaths was due to pulmonary embolism, and the other was due to a pheochromocytoma. During this same 4-year period, an estimated 232,600 cases of ectopic pregnancy occurred in the United States, for a risk of death of 7.1 per 10,000 cases (Table 1).

In the study period, more than half (55%) of the decedents were women of black and other races, despite the fact that white women had almost three times as many ectopic pregnancies. Consequently, the risk of death due to an ectopic pregnancy for women of black and other races was 3.6 times the risk for white women. Of the 166 women who died, 80 were black, 64 were white, 10 were of Asian or Pacific Islander descent, 10 were Hispanic, and two were native American.

The risk of death showed no consistent relationship to age (range = 16-43 years). Eighty percent of the decedents were 20-34; 14%, ≥35; and 6%, ≤19 years of age.

More than half (51%) of the women were married at the time of death. However, the risk of death for women who either had never married or had been previously married was about 1.7 times the risk for married women.

The risk of death due to ectopic pregnancy was similar in the four geographic regions. All 166 deaths occurred in 32 states and New York City. Approximately 45% of these deaths occurred in the four reporting areas with the largest number of ectopic pregnancy deaths.

In 90 instances, the gestational age was known at the time symptoms began (Table 2). In approximately one-third of these, the gestational age was <7 weeks; in one-third, 7-9 weeks; and one-third, ≥10 weeks. Because pain is the most commonly reported symptom of ectopic pregnancy (*7*), each case was reviewed to determine if pain had preceded the death. In the 122 instances in which this information was available, almost all of the patients (96%) experienced pain during the pregnancy.

In 101 instances, the gestational age was known at the time of death. In approximately half of these, the gestational age was ≤9 weeks; in the other half, it

was ≥10 weeks. The site of the ectopic pregnancy was known in almost all (97%) cases. Eighty-one percent of the pregnancies were tubal; 12%, cornual; and 7%, abdominal.

Routine diagnostic studies for ectopic pregnancy were not performed in many of the 166 cases. For example, although the records did not indicate whether a pregnancy test was performed in 63 of these cases, they showed that a pregnancy test was not performed in 52 (50%) of the other 103 cases. Furthermore, in the 118 instances in which information was available concerning ultrasonograms, 107 (91%) of the women did not have an ultrasonogram. Similarly, in the 138 instances in which information was available concerning culdocentesis, 75% of the women did not have this procedure. In 109 cases, the type of final primary physician was known. Half of these physicians were board certified, board eligible, or residents in obstetrics and gynecology.

Information about the patient's treatment was available for most (92%) of the cases. In these cases, more than half (59%) of the women received no treatment. Of the 165 women whose cause of death was known, 146 (88%) died from hemorrhage. Two-thirds of those who died from hemorrhage had no surgery, whereas one-third died from hemorrhage either during or after surgery. The place of death was known in all but four of the 166 cases. Almost two-thirds of these deaths occurred in the

Table 1. Risk of death per 10,000 ectopic pregnancies and relative risk, by year, race, age, marital status, and region, United States, 1979-1982

Characteristics	Distribution of deaths (N = 166)	Distribution of ectopic pregnancies (N = 232,600)*	Risk	Relative risk (95% CL†)
Year				
1979	39	50,000	7.8	NA
1980	46	52,200	8.8	NA
1981	36	68,000	5.3	NA
1982	45	62,400	7.2	NA
Race				
White	74	172,400	4.3	Referent
Black and others	92	60,200	15.3	3.6 (2.7-4.7)§
Age (years)				
≤ 19	10	13,700	7.3	1.3 (0.9-1.9)
20-24	46	61,900	7.4	1.3 (0.9-1.8)
25-29	47	81,800	5.7	Referent
30-34	40	53,400	7.5	1.3 (0.9-1.8)
> 35	23	21,800	10.6	1.8 (1.3-2.6)§
Marital status				
Current	85	144,000	5.9	Referent
Never married	54	55,800	9.7	1.6 (1.2-2.2)§
Previously married	23	22,900	10.0	1.7 (1.1-2.4)§
Region				
Northeast	40	49,100	8.1	1.3 (0.9-1.8)
North Central	37	57,900	6.4	Referent
South	51	70,300	7.3	1.1 (0.8-1.6)
West	38	55,300	6.9	1.1 (0.8-1.5)

*Rounded to the nearest hundred. Sums of values may not equal totals because of rounding.
†Confidence limits
§Significant at $p < 0.05$.
NA – Not applicable

hospital, and the others occurred either at home or in transit to the hospital. Finally, nine of the ectopic pregnancy deaths reportedly occurred after an attempted abortion.

Discussion

This is the only surveillance system in which nationwide data on ectopic pregnancy mortality are systematically collected and analyzed. Independently, a comparable number of ectopic pregnancy deaths (168) were reported through national vital statistics for the same period.

Table 2. Selected characteristics of 166 women dying from ectopic pregnancy, United States, 1979-1982

Characteristics*	Number of deaths	Percent†
Gestational age (weeks) at onset of symptoms (N = 90)		
<7	31	34
7-9	29	32
10-12	14	16
>12	16	18
Pain (N = 122)		
Yes	117	96
No	5	4
Gestational age (weeks) at death (N = 101)		
<7	22	22
7-9	30	30
10-12	24	24
>12	25	25
Site of pregnancy (N = 161)		
tubal	130	81
cornual	19	12
abdominal	12	7
Diagnostic studies		
pregnancy test (N = 103)	51	50
ultrasonogram (N = 118)	11	9
culdocentesis (N = 138)	34	25
Final primary physician (N = 109)		
obstetrician-gynecologist	55	50
not obstetrician-gynecologist	26	24
none	28	26
Procedure for treatment (N = 152)		
laparotomy	62	41
none	90	59
Cause of death (N = 165)		
hemorrhage without surgery	98	59
hemorrhage with surgery	48	29
infection with surgery	5	3
anesthesia complication	3	2
other causes	11	7
Place of death (N = 162)		
hospital	98	60
home	45	28
in transit	13	8
other	6	4

*Number known

†Percentage of known cases. The sum of percentages for each characteristic may not be 100% because of rounding.

The data in this report support the findings of previous studies based on this surveillance system for 1979-1980 (*3,4*). The risk of death from ectopic pregnancy is much greater than that associated with uterine pregnancy (*3,8,9*). For example, in 1982, 237 maternal deaths were due to direct or indirect obstetric causes (this excludes deaths due to ectopic pregnancy and abortion) (*2*), and there were 3,680,537 live births (*10*). In the same year, of the 1,303,980 legally induced abortions reported, 11 resulted in death (*11*). Consequently, 248 deaths occurred among 4,984,517 uterine pregnancies, a risk of five deaths per 100,000 uterine pregnancies. In comparison, 45 deaths occurred among an estimated 62,400 ectopic pregnancies, a risk of 72 deaths per 100,000 ectopic pregnancies. These findings indicate that, in 1982, the relative risk of death associated with ectopic pregnancy was about 14 times greater than that associated with uterine pregnancy.

The relative risk of death from ectopic pregnancy for women of black and other races is about 3.5 times that for white women (*1,3*). This risk is comparable with the threefold risk of death for black and other races for abortions (*12*) and for all maternal deaths (*13*). In 1979-1982, of the 92 women in the "black and other races" category who died from ectopic pregnancy, 80 (87%) were black.

Hemorrhage was the cause of death in 88% of all ectopic pregnancy deaths. A diagnosis of ectopic pregnancy before rupture might have prevented some of these deaths. For this reason, prenatal care in the first trimester may facilitate the diagnosis and management of ectopic pregnancy before rupture. The increased risk of ectopic pregnancy death in blacks may be related to the timing and quality of prenatal care among black women. Although data on comparative quality of prenatal care are not available, date of initiation of prenatal care is routinely collected for live births. Among the women who have live-born infants, fewer blacks than whites begin prenatal care in the first trimester. For example, among women delivering in 1983, about 60% of black women and 80% of white women began prenatal care in the first trimester (*14*).

This report contains some caveats for the clinician that may help prevent ectopic pregnancy deaths. First, pain—in addition to being the most commonly reported symptom of ectopic pregnancy—precedes almost all (96%) ectopic pregnancy deaths. This finding reemphasizes the traditional maxim of "think ectopic," especially when the clinician is evaluating a woman of reproductive age who has abdominal pain. Second, the three most important tests for the early diagnosis of ectopic pregnancy are culdocentesis, ultrasonogram, and human chorionic gonadotropin assay (*15*). However, a pregnancy test was performed in only half of the 103 ectopic pregnancy deaths for which information is available. In addition, only a fourth of 138 decedents had culdocentesis, and less than a tenth of 118 decedents had an ultrasonogram. If all three of these tests had been performed on these patients, some of the women might not have died. Finally, in 58 (36%) of the 162 ectopic pregnancy deaths for which the place of death is known, the women died either at home or in transit to the hospital. Therefore, when a clinician suspects that a patient may have an ectopic pregnancy, a diagnosis should be made and the treatment started as soon as possible. Any delay may result in death.

Some factors may have affected the accuracy of the number of ectopic pregnancies and ectopic pregnancy deaths reported here. Estimates of ectopic pregnancies were derived from a sample of medical records of patients discharged from hospitals and are therefore subject to sampling error. In addition, some ectopic pregnancies

resolve spontaneously, and the women are not hospitalized (*16*). Furthermore, the number of ectopic pregnancies in 1981 was much higher than expected on the basis of rates of increase for the period 1970-1980 (*1*). On the other hand, the determination of an ectopic pregnancy death frequently depends on surgical or autopsy findings, or both, and some deaths that occurred without surgery or an autopsy may not have been reported. However, since ectopic pregnancy deaths occur in women of reproductive age, an autopsy is probably more likely for this condition than for other fatal conditions that affect an older population.

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